REMARKS

Claims 1-9 remain in this application. Claims 1, 3 and 5 have been amended. Present amendments supercedes the changes made to claims 1, 3 and 5 in the Amendment filed on May 14, 2003, since the previously filed amendments were not entered, as indicated in the Advisory Action dated June 17, 2003.

Formal drawings incorporating the changes made to Figs. 1 and 2 in a Request for Approval of Drawing Changes filed November 18, 2002 have been submitted with the Amendment filed May 14, 2003, as required by the Examiner.

The drawings are objected to because reference character "5" has been used to designate both a transducer and a coupler. Similarly, the Specification is objected to for referring to both a transducer and a coupler as reference number 5. In the Amendment filed in response to the Office Action dated July 18, 2002, the Specification had been amended to read "a measurement transducer or coupler 5". It should be noted that there is no article in front of the word "coupler" and, accordingly, "a measurement transducer or coupler 5," refers to only one element. As such, reference character "5" is not being used to designate two elements. Regardless, the Specification has been amended to delete the term "transducer" with respect to reference character 5, to expedite prosecution.

Claims 1, 2, 5, 6 and 9 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Kaede et al. Claims 1 and 5 have been further amended in response to the Examiner's comments in the Advisory Action dated June 17, 2003, that features of the present invention described in Applicants' arguments are not positively claimed. Specifically, the claims have been amended to more clearly describe that the present invention compensates signal changes of a plurality of single signals which form an optical wavelength-division multiplex signal. Claims 1 and 5 further recites that a part of the entire optical wavelength-division multiplex signal is coupled out to generate a control signal and that this control signal is used to compensate for the signal changes of the plurality of single signals caused by cross phase modulation.

Applicant respectfully traverses the rejection based on Kaede et al. because the reference does not disclose or suggest the features for compensating for signal changes of a plurality of single signals forming an optical wavelength-division multiplex signal caused by cross phase modulation in a fiber amplifier. The reference also does not disclose or suggest generating a

control signal from a part of the entire wavelength-division multiplex signal for controlling a phase modulator to compensate cross phase modulation. Each of the single signals in the multiplex signal is responsible for cross phase modulation of other single signals. By generating a control signal from the entire multiplex signal itself, cross phase modulation can be reduced for all single signals at the same time.

The Kaede et al. reference teaches individually compensating for wavelength dispersion of each single signal. The reference teaches that even when a multiplex signal is transmitted, pre-equalization is performed for each signal separately (see col. 4, lines 45-49 and Fig. 14 and its corresponding descriptions). The Kaede et al. reference, however, does not teach or suggest, or even contemplate, cross phase compensating signal changes of a plurality of single signals in a multiplex signal by a control signal which is generated from the entire multiplex signal itself, as in the present invention. The purpose of the Kaede et al. reference, namely, dispersion compensation, which is accomplished by modulating the light frequency (carrier) by the associated data signal is entirely different from the problem and solution of the present invention. For these reasons, claims 1 and 5 and their dependent claims 2-4 and 6-9 are allowable over Kaede et al.

With respect to claim 5, the Office Action states that the Kaede et al. reference teaches a measurement coupler which couples out part of a WDM signal. However, as shown in Fig. 14, the reference clearly teaches that dispersion pre-equalization circuits are each separately used for correcting only one signal from among many in the WDM signal, but does not disclose or suggest coupling out a part of the entire WDM signal, as in the present invention.

In Kaede et al., a signal is pre-chirped with its own data sequence. More specifically, the Kaede et al. reference teaches a method of pre-chirping data, in which impulses are used to compensate the dispersion effect. As is known in the art, dispersion results in a broader impulse at the receiving end. For XPM, only the edges of the pulses of the disturbing signal are relevant. A walk-off between a disturbed signal and a disturbing signal broadens the disturb time of each disturbed signal over the whole of the fiber and leads to a less disturbing effect. The method of pre-chirping disclosed in Kaede et al., however, is not the same as actively compensating the phase of the disturbed signal by a phase modulator. The present invention is used to compensate

the XPM induced by a fiber amplifier. As such, there is no walk-off at all between the single signals of the multiplex signal. The phase modulator is always adjacent the amplifier.

Saunders et al., on the other hand, teaches a method of XPM compensation, which is entirely different from the method of Kaede et al. In Saunders et al., the disturbed signal is modulated by the envelope of a disturbing signal. This method is applied to compensate the XPM induced in the fiber NZ-DSF. The effect of XPM is measured at the receiving end at the fiber DCF. There are two ancillary effects relevant for compensation. The walk-off, as a side effect, reduces the XPM while the signals travel along a fiber having dispersion, and the phase modulation as applied tends to compensate the XPM in the phase modulator. Therefore, the walk-off which reduces the XPM, makes the compensation through a phase modulator more difficult because the compensating signal has also a walk-off against the disturbing signal and the disturbed signal. Accordingly, in contrast to the assertion in the Office Action, the Saunders et al. reference does not provide support that phase modulation and walk-off in the Kaede et al. reference inherently filters XPM.

In addition, expanding the teachings of Saunders et al. in such a way to compensate a multiplex signal tends to become extremely expensive for the following reasons. The multiplex signal must be demultiplexed into single signals. For each single signal a separate phase modulator would be necessary, and each phase modulator would be controlled by all other single signals which are used as control signals, and for each separate phase modulator, a separate combiner for all compensating signals would be required to form a compensation signal, and another combiner would be required for multiplexing the single signals to form a compensated multiplex signal, which would add attenuation and additional linearity problems.

As discussed above, the present invention is directed to XPM compensation of a multiplex signal induced by a fiber amplifier. In contrast to the cited references, the present invention uses a part of the entire multiplex signal as a control signal, and only one phase modulator for compensating all the signals that make up the multiplex signal. These features are not disclosed or suggested in the cited references.

In the Advisory Action, the Kaminow et al. reference is cited to further support the assertion that dispersion walk-off in the system of Kaede et al. inherently reduces cross phase modulation. Specifically, the Advisory Action states, "Kaminow et al. reference teaches that

cross phase modulation is negligible when a pulse walks completely by a disturbing pulse." This statement simply means that the CPM (XPM) is reduced when the pulses have different speeds, which is well known in the art, but unrelated to the present invention. In the present invention, walk-off effect is not used to reduce CPM. As described on page 4, first paragraph of the Specification, the present invention works because there are no delay differences (i.e., no walk-off) between the signals. This is because a control signal is provided which modulates all the individual signals together, which is exactly opposite the way it is done with respect to CPM. As such, Applicants respectfully submit that the Kaminow et al. reference does not in any way add to the position that the cited reference Kaede et al. reference discloses or suggests the present invention, either inherently or otherwise.

Claims 3, 4 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kaede et al. Applicant respectfully traverses this rejection for the reasons given with respect to claims 1 and 5, from which claims 3, 4 and 7 depend, and because of the additional features recited in these dependent claims.

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kaede et al. in view of Becker et al. Applicant respectfully traverses this rejection for the reasons given with respect to claim 5, from which claim 8 depends, and because of the additional features recited in claim 8.

In light of the above, Applicants respectfully submit that independent claims 1 and 5, as well as claims 2-4 and 6-9 which depend therefrom, are both not anticipated and non-obvious over the art of record. Accordingly, Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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